

black mirror in that instrument. Of course the nephoscope and its methods are crude compared with photography, but it should be in everyone's hands, even if one also has a photogrammeter.

In the introduction Mr. Clayden indicates the need of a much more elaborate system of names for clouds than is afforded by the simple international system. He would like to have that considered as a list of the names of cloud *genera* and as open to elaboration by the insertion of specific names for varieties, whose peculiarities depend upon the conditions under which they are formed. The present writer would add that in August, 1895, at the meeting of the American Association for the Advancement of Science, at Springfield, Mass., he submitted quite an elaborate system of notation and symbols (as being better than a list of Latin names), by which he was able to indicate to the eye at a glance many of the conditions leading to the formation of any special variety of cloud. It was a sort of picture writing that would appeal to everyone, and be adaptable to all possible combinations, and could easily become an international system. The discussion that followed the presentation of the paper was so discouraging that the author has refrained from publishing it, but may do so at some future time, as it partially meets the needs indicated by Mr. Clayden.

Sixteen varieties or genera of clouds were recognized by the International Cloud Atlas, and 35 additional varieties or species, with their names, occur in the course of Mr. Clayden's volume, all of which are systematically arranged in his tenth chapter; we quite agree that, as the author suggests, further additions, and in fact numerous ones, must be made when we come to study clouds in other climates than that of England.

Apparatus and photographic methods are described in the latter part of the book, so that anyone may begin at once to follow in the author's footsteps. Historical matters are mentioned in the introductory chapter, but our special interest is attracted by the material published in Chapters II-VIII. Beginning with the cirrus cloud Clayden mentions that the loftiest variety, which he calls the cirrus-excelsus, is visible like a silvery curtain when the whole sky is so dark that third and fourth magnitude stars are visible. This is the so-called phosphorescent cloud, or nocti-luminous cloud, but it is not likely that the cloud is self-luminous; it is more likely that it is visible by its reflection of very distant twilight. The highest altitude obtained for a specimen of this cloud is given on page 32 as 17.02 miles, or more than 27,000 meters, on the afternoon of June 12, 1899, at Exeter. But on page 150 the same cloud apparently is spoken of as observed one morning, on a day of very hot, damp weather, at the altitude of 27,413 meters, or about seventeen miles. We believe that there is only one observation of this kind of cloud on record in the United States.<sup>1</sup> Of course at this altitude clouds formed of aqueous particles, whether water or ice, are extremely improbable and not likely to be dense enough to be visible. The rate of diminution of vapor pressure with ascent is such that visible clouds more than fifteen miles high must be of the rarest occurrence. But on the other hand clouds of meteoric matter are very common, and it is worth inquiring whether our nocti-luminous clouds, or cirrus excelsus, may not be of some such foreign origin, like the auroral clouds and other phenomena that are supposed to depend upon the electrons of cosmic space.

In Plates XX and XXI Clayden gives companion pictures taken within a half minute of each other, looking toward the west and the northwest, respectively, giving us a panorama of the western sky while the sun was nearing the horizon. The

photographs, therefore, represent the under surface of a sheet of hazy cirro-cumulus illuminated by the setting sun. The gorgeous sunset colors on these clouds can not be given. The clouds themselves were composed of icecrystals that had a half hour previously given rise to a solar halo.

Numerous references to the relations between clouds and subsequent weather are given. Thus on page 81 Clayden states that he has made a series of measurements of the thickness of clouds necessary to the production of a shower of rain. In winter no rain will fall from a cloud unless its thickness is at least a hundred meters; in summer the thickness must be rather greater. If, however, the temperature is so low that the cloud is formed only of flakes of snow, then this may fall from a layer of thin lifted fog not quite thick enough to hide the blue color of the sky. Under ordinary conditions of temperature rain is unlikely, or small and trifling, if the thickness is less than two thousand feet or six hundred meters. The heaviness of the rain and the size of the drops increase with the thickness of the cloud. If the height from base to summit be two or three thousand feet the fall will be gentle; four thousand to six thousand feet gives large drops and a fairly heavy shower; six thousand to ten thousand feet in the summer time gives cold heavy rains and hail. In general the rain cloud does not differ in any way from the rainless, except in thickness.

In the same connection (on page 96), speaking of the cumulus Clayden adds that small cumuli, less than one hundred and twenty meters thick, rarely produce rain, and nothing like a heavy shower is likely unless the thickness exceeds four hundred meters. As the cumulus drifts over the landscape it seldom maintains its showery character for more than ten or fifteen miles, often for much less. Its activity as a rain producer is checked by the checking of the ascending currents of air, both by the mechanical action of the falling raindrops and by the cooling influence of these drops on the lower part of the ascending column. The formation of long trains of cumuli in connection with the hills or other orographic features, is fairly well explained, but we hardly agree with Clayden's suggested explanation of the fact that the relative humidity within clouds and fogs is generally observed to be less than 100 per cent.

Chapter VIII is given up to wave clouds, and suggests many problems for both the observer, the experimentalist, and the mathematician.—C. A.

#### WEATHER BUREAU MEN AS EDUCATORS.

The following lectures and addresses by Weather Bureau men are reported:

Mr. M. E. Blystone, December 18, 1906, before the Franklin Society of Providence, R. I., on "The Work of the Weather Bureau".

Mr. N. B. Conger, of the Detroit, Mich., office, December 6, 1906, before the Windsor Literary and Science Club, of Windsor, Ont., on "The Weather Bureau and its Work".

Mr. P. Connor, October 11, 1906, before the pupils of the Manual Training High School, Kansas City, Mo., on weather topics; also December 16, 1906, before a bible class of the Independence Avenue Methodist Church, on "Meteorological Instruments and Weather".

Mr. H. W. Richardson, December 12, 1906, before the Men's League of the First Methodist Church, Duluth, Minn., on "The U. S. Weather Bureau"; also December 28, 1906, before the Northern Railway Club, on "Weather in its Relation to Railroad Operations".

Mr. J. Warren Smith, November 30, 1906, before the Ohio Academy of Science, at its annual meeting, in Columbus, Ohio, on "Weather and Crop Yield".

Classes from schools and academies have visited Weather

<sup>1</sup>See the Monthly Weather Review for December, 1904, page 560, where Rev. W. S. Rigge records an observation made on July 18, 1904, at Omaha, but the altitude is not stated.

Bureau offices, to study the instruments and equipment and receive informal instruction, as reported from the following offices:

Des Moines, Iowa, December 18, 1906, the physical geography class from the North High School.

Duluth, Minn., December 15, 1906, members of the physiography section of the Superior, (Wis.) State Normal School.

Kansas City, Mo., November 14, 1906, a class from Loretto Academy.

Little Rock, Ark., December 12, 1906, the science class from the Little Rock, High School.

Mobile, Ala., December 7, 1906, a section of the girls' class in physics from Barton Academy; also December 13, a section of the boys' class in physical geography from Barton Academy; also December 14, the class in physics from McGill Institute.

Raleigh, N. C., December 15, 1906, the physical geography class from Peace Institute.

San Jose, Cal., December 12, 1906, the physics class from the San Jose High School.

#### RECENT ADDITIONS TO THE WEATHER BUREAU LIBRARY.

H. H. KIMBALL, Librarian.

The following titles have been selected from among the books recently received, as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies. Most of them can be loaned for a limited time to officials and employees who make application for them.

**American Association for the Advancement of Science.**  
Proceedings. 55th meeting, New Orleans, Dec., 1905-Jan., 1906. Washington, 1906. 589 pp. 8°.

**Association Française pour l'Avancement des Sciences.**  
Compte rendu de la 34<sup>me</sup> session. Paris. 1906. 1120 pp. 8°.

**Bezold, Wilhelm von.**  
Gesammelte Abhandlungen aus den Gebieten der Meteorologie und des Erdmagnetismus. Braunschweig. 1906. viii, 448 pp. 8°.

**Black, F. A.**  
Terrestrial magnetism and its causes... London. 1905. (12), 226 pp. 8°.

**Börnstein, R[ichard].**  
Der neuerrichtete öffentliche Wetterdienst für Norddeutschland. (S. A. Verh. phys. Ges. Braunsch. 8 Jahrg. No. 20.) Braunschweig. 1906. Pp. [511]-513. 8°.  
Die halbtägigen Schwankungen der Temperatur... (S. A. Verh. phys. Ges. Braunsch. 8 Jahrg. No. 20.) Braunschweig. 1906. Pp. [517]-518. 8°.

**Bracke, A.**  
La densité de la neige. Bruxelles. 1906. 31 pp. 8°.  
Mon baromètre. 2 ed. Mons. 1906. 20 pp. 8°.  
La photographie des nuages. Mons. 1905. 28 pp. 16°.  
La représentation des situations atmosphériques. Mons. 1904. 32 pp. 8°.

**British East Africa. Agricultural Department.**  
Meteorological conditions. Leaflet 11. [Mombasa]. 1905. 4 pp. 12°.  
Meteorological reports. 1904. n. p. 1905. 40 pp. 8°.  
Same. 2d annual report. 1905. n. p. 1906. [24] pp. 8°.

**Cafiero, Federico.**  
Il R. Istituto Nautico "Ruggero di Lauria" in Riposto. Riposto. 1905. 111, [3] pp. 4°.

**Canada. Meteorological Service.**  
Report for ... 1904. Ottawa. 1906. (18), 278 pp. 4°.

**Crespin, J.**  
Le climat d'Alger au point de vue hivernal. (Extr. Compt. rend. Congrès Soc. savantes, 1905. Sciences.) Paris. 1905. 7 pp.

**Exner, Felix M.**  
Grundzüge einer Theorie der synoptischen Luftdruck. Wien. 1906. 76 pp. 8°.

**Fritzsche, Richard.**  
Niederschlag, Abfluss und Verdunstung auf den Landflächen der Erde. Inaug.-Diss... Halle-Wittenberg. Halle a S. 1906. [2], 54, [2] pp. 8°.

**Hadden, David E.**  
Progress and problems of solar physics during the last fifty years. (Repr. Proc. Sioux City acad. sc., Alta, Iowa. v. 2.) [1906.] 6 pp. 8°.

**Hogarth, David George.**  
... The penetration of Arabia... New York. [1904.] xiii, 359 pp. 12°.

**Jeans, J. H.**  
The dynamical theory of gases. Cambridge. 1904. [4], 352 pp. 4°.

**Johnston, Sir Harry.**  
Liberia. 2 vols. London. 1906. (28), 519; (16), 1183 pp. 8°.

**Köppen, W.**  
Klimakunde. I. Allgemeine Klimalehre. Leipzig. 1906. 132, [2] pp. 24°.

**Lenard, P.**  
Ueber Kathodenstrahlen... Leipzig. 1906. 44 pp. 8°.

**Millot, C.**  
Brouillards de mars et gelées de mai. La lune rousse. (Extr. Bull. Soc. sc. Nancy.) Nancy. 1905. 10pp. 8°.  
L'été de la Saint-Martin. (Extr. Bull. Soc. sc. Nancy.) Nancy. 1906. 8 pp. 8°.

**Mitchell, J. Cairns.**  
Results of meteorological observations taken in Chester during 1904. (Repr. Proc. Chester soc. nat. sc., Chester. 1904-5.) n. p. [190?] 4, [4] pp. 8°.

**Moedebeck, H. W. L.**  
Die Luftschiffahrt, ihre Vergangenheit und ihre Zukunft; insbesondere das Luftschiff im Verkehr und im Kriege. Strassburg. 1906. (6), 137 pp. 8°.

**Neesen, Friedrich.**  
Die Sicherungen von Schwach- und Starkstromanlagen gegen die Gefahren der atmosphärischen Elektrizität. Braunschweig. 1899. 120 pp. 8°.

**Paris. Observatoire Municipal de Montsouris.**  
Annales. Tome 6. Paris. 1905. 495 pp. 8°.

**Richard, L.**  
Géographie de l'Empire de Chine... Chang-hai. 1905. [18], 564, (22) pp. 12°.

**Rodriguez de Prada, Angel.**  
Meteorologia dinamica. 2 ed. Madrid. 1902. vii, 158 pp. 4°.

**Schoentjes, H.**  
Fleurs de la glace. Gand. 1905. 43 pp. 39 pl. 8°.

**Sommer, Emil.**  
Die nicht auf den Meeresspiegel reduzierten Jahres-, Januar-, April-, Juli- und Oktober-Isothermen Deutschlands. Inaug.-Diss... Freiburg i. B. Mannheim. 1906. 83 pp. 8°.

**Stützer, Arnold.**  
Vergleichende Temperaturmessungen zu Marburg a. d. L. und seine barometrische Meereshöhe. Inaug.-Diss... Marburg. 1906. 67 pp. 8°.

**—**  
The voyage of the *Scotia*. Being the record of a voyage of exploration in Antarctic seas. By three of the staff. Edinburgh. 1906. (24), 375 pp. 8°.

**Weise, W.**  
Die Kreisläufe der Luft nach ihrer Entstehung und in einigen ihrer Wirkungen. Berlin. 1896. 4, [2], 86 pp. 8°.

**Zuntz, N. and others.**  
Höhenklima und Bergwanderungen in ihrer Wirkung auf den Menschen. Berlin. 1906. xvi, 494 pp. 4°.

#### RECENT PAPERS BEARING ON METEOROLOGY.

H. H. KIMBALL, Librarian.

The subjoined titles have been selected from the contents of the periodicals and serials recently received in the Library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau. Unsigned articles are indicated by a —

*Astrophysical Journal*. Chicago. Vol. 24. Dec., 1906.

Very, Frank W. The temperature of the moon. Pp. 351-354.

*Geographical Journal*. London. Vol. 29. Jan., 1907.

— The Alps as a weather-parting. P. 84.

— Hoar-frost at high altitudes. [Note.] P. 95.

*Journal of the Meteorological Society of Japan*. Tokio. 25th year. Nov., 1906.

Sasaki, T. Result of examinations of the pulse-rate on Mount Fuji.

*Nature*. London. Vol. 75.

G., F. Scientific work on Mont Blanc. (Dec. 27, 1906.) Pp. 203-204.

Collins, F. G. Emerald green sky color. (Jan. 3, 1907.) P. 224.

Hann, J[ulius]. Indian climatology. (Jan. 10, 1907.) Pp. 241-244.

*London, Edinburgh, and Dublin Philosophical Magazine*. London. 6 ser. Vol. 13. Jan., 1906.

Chree, C. Auroral and sun-spot frequencies. Pp. 149-164.

*Popular Science Monthly*. New York. Vol. 70. Jan., 1907.

Meier, Konrad. The sanitation of air. Pp. 19-32.